BARRICK

BARRICK RESOURCES (USA), INC.

May 29, 1991

Mr. Don A. Ostler, P.E.
Executive Secretary
Utah Water Pollution Control Committee
P.O. Box 16690
Salt Lake City, Utah 84116-0690

Dear Mr. Ostler:

SUBJECT: Reservation Canyon Tailing Impoundment - Request for 1991 Construction Activity

Pursuant to our meeting of May 23, 1991, please find attached the following requested information:

Attachment 1: Discussion on tailing impoundment operation and implication of additional stored material.

Attachment 2: Design and construction approval for Reservation Canyon tailing impoundment modification, R. L. Morgan, Utah State Engineer, May 22, 1991.

A review of Attachment 1 clearly indicates a relatively minor environmental impact of the proposed additional tailing deposition. Also, any impact will be slowly realized over the course of the next twelve months.

As stated in Attachment 2, the State Engineer has approved the modified design and construction techniques. To address immediate dam safety/freeboard concerns, construction of the 1991 dam lift should commence as soon as possible. No additional earthen liner construction will be initiated until resolution of our request to the Bureau for 1991 construction is achieved.

This matter is of critical concern to Barrick, and we believe the proposed 1991 construction activity simply constitutes a minimal modification to the existing regulatory situation. We also believe the substantive environmental issues to be discussed and negotiated during the groundwater quality discharge permitting process will not in any way be adversely impacted by the proposed 1991 construction activity.

Barrick Mercur Gold Mine
P.O. Box 838, Tooele, Utah 84074 Telephone (801) 268-4447 FAX(801) 266-4296

It is our hope that we can come to a mutually acceptable agreement on this proposal as soon as possible. Please do not hesitate to contact me or Glenn M. Eurick of my staff at your discretion.

Thank you for your consideration.

Sincerely,

Frank D. Wicks
Vice President and General Manager

FDW/cg

Attachments

cc: D. P. Beatty
G. M. Eurick
T. B. Faddies
C. L. Landa
C. L. Olsen
M. P. Richardson
R. R. Sacrison
G. Bagley (Utah Attorney General's Office)
D. R. Bird (Parsons, Behle & Latimer)
G. W. Condrat (Dames & Moore)
W. Hedberg (DOGM)
G. Shelley (Utah County Health)
J. Trujillo (Tooele County Health)

ATTACHMENT 1

The effects of extending the liner and allowing the pool to advance are presented below. Two features are important in addressing the concerns of increasing head on the liner: (1) The tails deposition method is a means to store solids within the lined basin. The process water is recycled for further use, with a minimal amount remaining within the tails deposit; (2) With an increased height of tailing, the pool itself does not necessarily increase in depth. Historically, it has simply transgressed the liner as newly deposited tails fill the basin along the south and west shores.

As of May 1, 1991, the tail water elevation was at 7252. The beach crest was at approximately 7258. The pond has a maximum depth of approximately 15 feet and covers approximately 30 acres. The tails have a maximum depth of 223 feet, with approximately 33 acres of exposed beach. Table I presents various statistics pertinent to this discussion.

The tails rise a nominal ten feet per year. Some effects of that rise over the life of the structure are shown on Table II. Under the most conservative assumption, the additional ten feet in 1991 increase the maximum potential head of 270 feet by 3.70%. This is perhaps the single most important consideration in assessing the expansion.

The second consideration is the geometry of the pond bottom itself. As tails settle out, they are deposited on the liner under a great portion of the pond. The current estimate is that 0.88 acres of the pond lie over liner alone, while 29.12 acres lie over the deposited tails. As such, the liner exposed directly to tail water is small in area. It is also subjected to low head, at an average of 7.5 feet H_2O.

The third consideration addressed here is the low permeability of the tails themselves. The hydraulic conductivity ranges from 5×10^{-6} to 7×10^{-6} cm/sec. This material has an average thickness of 112 feet under the pond. With this data, it is instructive to compare the hydraulic performance of the tails and the permitted six-inch thick liner. That liner has a designed permeability of 1×10^{-7} cm/sec.

The hydraulic characteristics of an earthen liner can be described by the following equation:

$$V = k\,(h/l) \qquad (1)$$

Where
V = Discharge Velocity (L/T)
k = Permeability (L/T)
h = Water Head (L)
l = Flow Length (L)

The hydraulic equivalence of two different barriers can be designed using the form of equation (1):

$$k_a(h/l_a) = k_b(h/l_b) \quad (2)$$

The effective water head, h, is the same for both cases. Thus:

$$k_a/l_a = k_b/l_b \quad (3)$$

In our example:

$k_a = 1 \times 10^{-7}$ cm/sec
$l_a = 0.5$ ft
$k_b = 5 \times 10^{-6}$ to 7×10^{-6} cm/sec
l_b = Equivalent Thickness, ft

and $$l_b = \left(\frac{k_b}{k_a}\right) l_a \quad (4)$$

For the values shown, 25 to 35 feet of tails are equivalent to one layer of the existing liner. Given the 112-foot average tails thickness, that tails is equivalent to over three times the permitted liner. At these thicknesses, it can be estimated there is no significant head increase on the pond liner.

To summarize: The initial consideration above shows a 3.70% increase in total available head. The second and third considerations show that the head must be transmitted through a tails plus liner barrier equivalent to more than four times the original liner barrier.

A rigorous discussion of the hydraulic characteristics of the tails liner is presented in the "Reservation Canyon Tailings Impoundment Hydrogeologic Investigation for Groundwater Discharge Permit." That document was submitted to your office April 21, 1991.

ATTACHMENT 2

State of Utah
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WATER RIGHTS

Norman H. Bangerter
Governor
Dee C. Hansen
Executive Director
Robert L. Morgan
State Engineer

1636 West North Temple, Suite 220
Salt Lake City, Utah 84116-3156
801-538-7240

May 22, 1991

Barrick Mercur Gold Mine
Attn: Ralph R. Sacrison, P.E., Construction Engineer
P.O. Box 838
Tooele, UT 84074

Re: Reservation Canyon Tailing Impoundment-Upstream Construction

Gentlemen:

Plans, specifications and supporting documentation for the above-referenced project are hereby approved pursuant to Section 73-5a of the Utah Code Annotated 1953, as amended. In order for the approval to remain valid, the conditions outlined in the following paragraphs must be complied with:

Prior to the initiation of any construction, the following information must be submitted to the State Engineer. This information should be updated during the initiation of each construction season.

1. The names and qualifications of the inspectors for the project.

2. The name of the contractor for the project, including the name of the contractor's representative(s) responsible for the project.

3. The estimated starting and completion dates for the project.

During the construction phase, the following information must be submitted to the State Engineer for review:

1. Results of all material tests undertaken should be submitted on a monthly basis.

2. Copies of daily inspection reports should be submitted monthly with the material test reports.

3. Documentation of any major change in construction practices or materials must be submitted, in writing, and approved prior to their use.

The following condition must be met to obtain final approval at the end of each construction season:

1. The State Engineer's office must be notified of, and involved in, a final inspection of the project that involves all interested parties.

As you are aware, the successful performance of this proposal will require careful monitoring to see if actual performance is consistent with design assumptions. We reserve the right to amend this approval if actual performance deviates significantly from the predicted performance.

This Decision is subject to the provisions of Rule R625-6 of the Division of Water Rights and to Sections 63-46b-13 and 73-3-14 of the Utah Code Annotated, 1953 as amended, which provide for filing either a Request for Reconsideration with the State Engineer, or an appeal with the appropriate District Court. A Request for Reconsideration must be filed with the State Engineer within 20 days of the date of this Decision. A court appeal must be filed within 30 days after the date of this Decision, or if a Request for Reconsideration has been filed, within 30 days after the date the Request for Reconsideration is denied. A Request for Reconsideration is considered denied when no action is taken 20 days after the Request is filed.

Your cooperation is appreciated and if you have any questions or need further clarification, please feel free to contact me or Richard Hall of our Dam Safety Section.

Sincerely,

Robert L. Morgan

Robert L. Morgan, P.E.
State Engineer

RLM:rbh:cp

cc: John Mann, Weber Area Engineer
Don Ostler, Water Pollution Control
W. Hedberg, Division of Oil, Gas and Mining

TABLE I

Tailing Impoundment Characteristics
Barrick Mercur Gold Mine
Reservation Canyon Tailing Impoundment

Current Lined Area	:	84 acres
Maximum Depth of Tails	:	223 feet
Average Depth of Tails	:	112 feet
Maximum Pond Depth	:	15 feet
Average Pond Depth	:	7.5 feet
Estimated Beach Area	:	33 acres
Estimated Pond Area	:	30 acres
Pond Elevation, May 1, 1991	:	7252 feet
Beach Crest, May 1	:	7258 feet
Estimated Pond Elevation, Dec. 31	:	7260 feet
Estimated Beach Crest Elevation, Dec. 31	:	7266 feet
Beach Slope (Submerged, H:V)	:	100:1
Liner Slope (H:V)	:	3:1
Pond Overlying Beach (33/34)30	:	29.12 acres
Pond Overlying Liner (1/34)30	:	0.88 acres
Liner Permeability	:	1×10^{-7} cm/s
Tails Permeability	:	$5 \times 10^{-6} - 7 \times 10^{-6}$ cm/s

TABLE II

Incremental Construction Quantities
Barrick Mercur Gold Mine
Reservation Canyon Tailing Impoundment

	Dam Height (in feet)	Liner Area (in sq. ft.)	Tails Deposited (in tons)
1983 - 1990	270	3,651,000	11,411,000
1991	10	153,000	1,852,000
1992 - 1999	60	1,423,000	15,430,000
TOTAL	340	5,227,000	28,693,000
1991 as % of:			
1983 - 1990	3.7%	4.2%	16.2%
1992 - 1999	16.7%	10.8%	12.0%
TOTAL	2.9%	2.9%	6.5%